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FORSCHUNGSZENTRUM

Hello CS&E

My Home Institute and Research Topics

Benjamin Schröder | May 11th 2016

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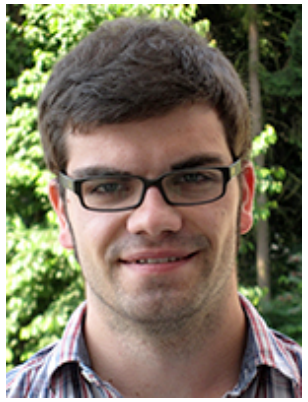
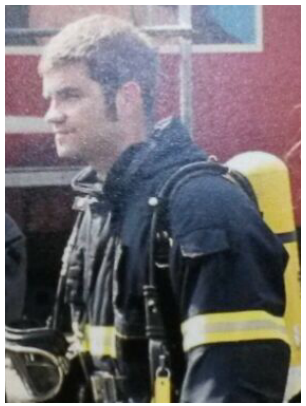
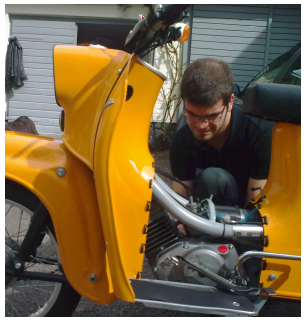
Contents

About me

- Benjamin Schröder
- 28 years old
- Studies at University of Wuppertal:
  - B.Sc. Safety Engineering
  - M.Sc. Fire Protection Engineering
- Profession:
  - 2011-2013 Siemens AG
  - since 2013 Forschungszentrum Jülich
- Voluntary fire department
- running, vintage bikes







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Where I am from…

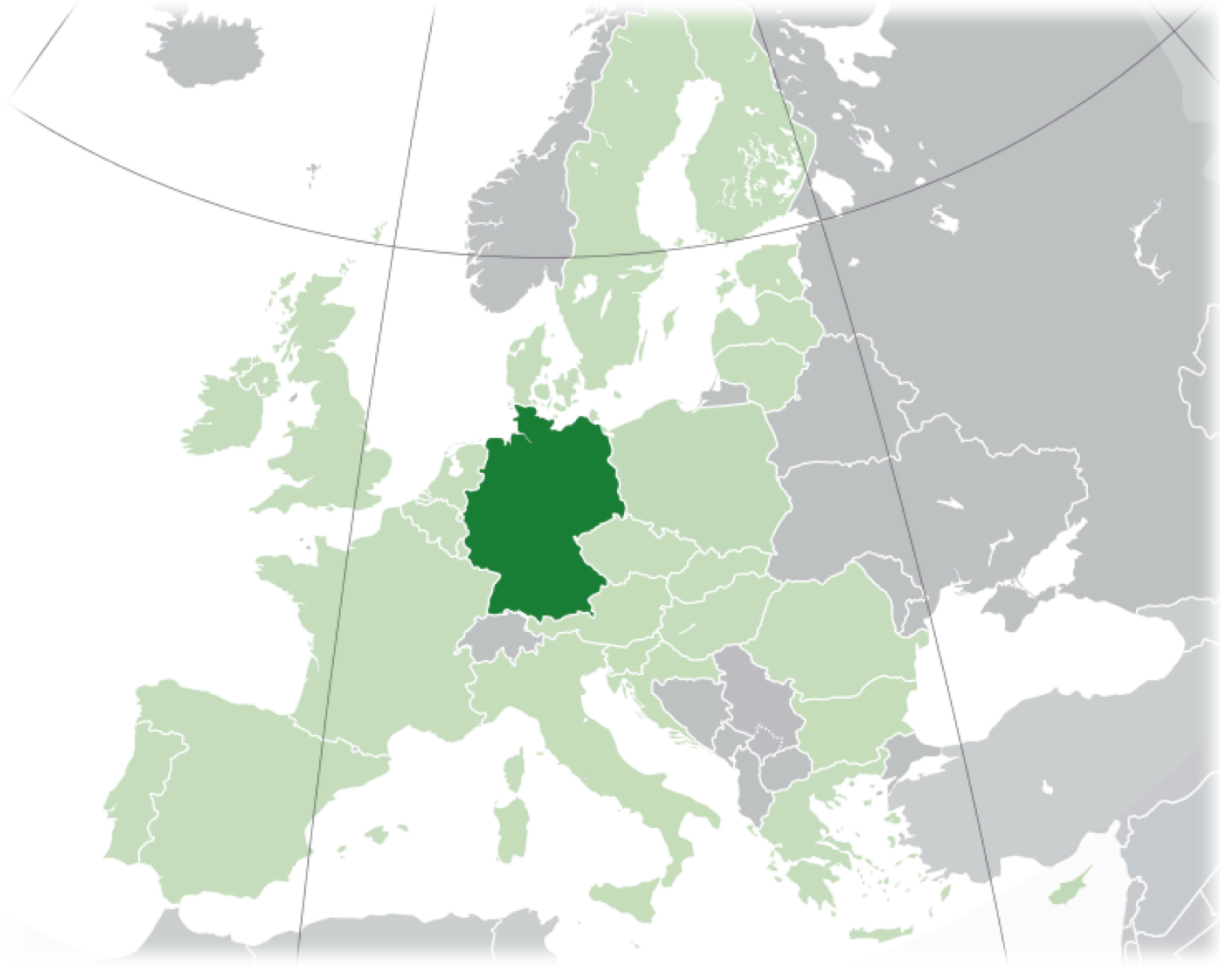

image: wikipedia

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Wuppertal

Jülich

Jena

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About my Institute | JSC

Jülich Research Centre

- the biggest research centre in Germany
- located between Aachen and Cologne
- area: 2.2 km²

- Staff: 5000 Persons
  - 1750 scientists
  - 1650 technical staff
  - 650 project management
  - 650 service and administration
  - 300 trainees

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JSC - Jülich Supercomputing Centre

- Europe's largest computing centre with +200 employees
- operation and development of *high performance computing* (HPC) systems
- development and application of software tools and scientific applications on HPC systems

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Division Civil Security and Traffic

Pedestrian Dynamics | Fire Simulation | Traffic

University of Wuppertal

Headed by Professor Seyfried

Faculty Architecture and Civil Engineering

Lectures:

- Fire and Evacuation Simulation
- Evacuation Design
- Informatics for Engineers
- Computer Simulation in Science

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Pedestrian Simulation

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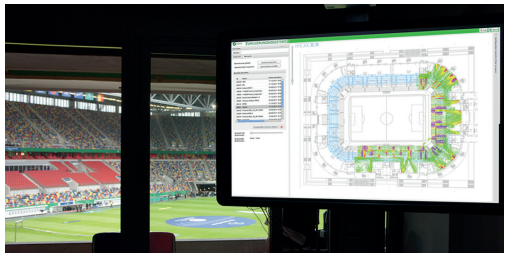
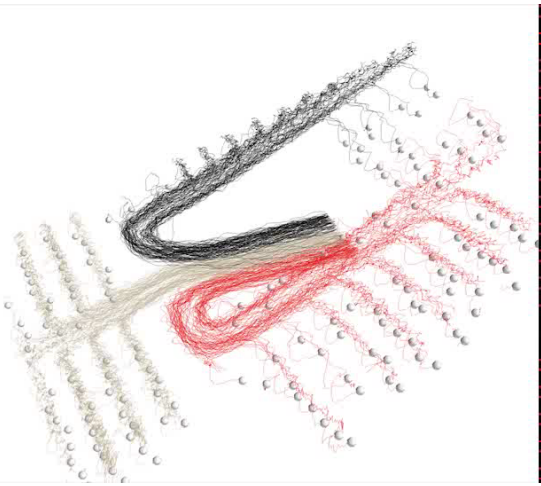
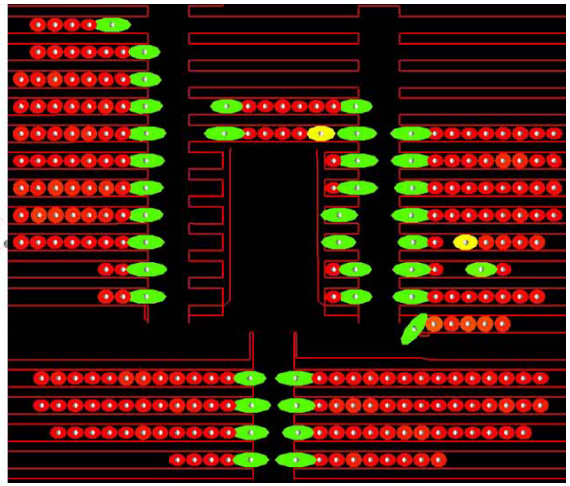
Pedestrian Dynamics

+ PeTrack

JuPedSim







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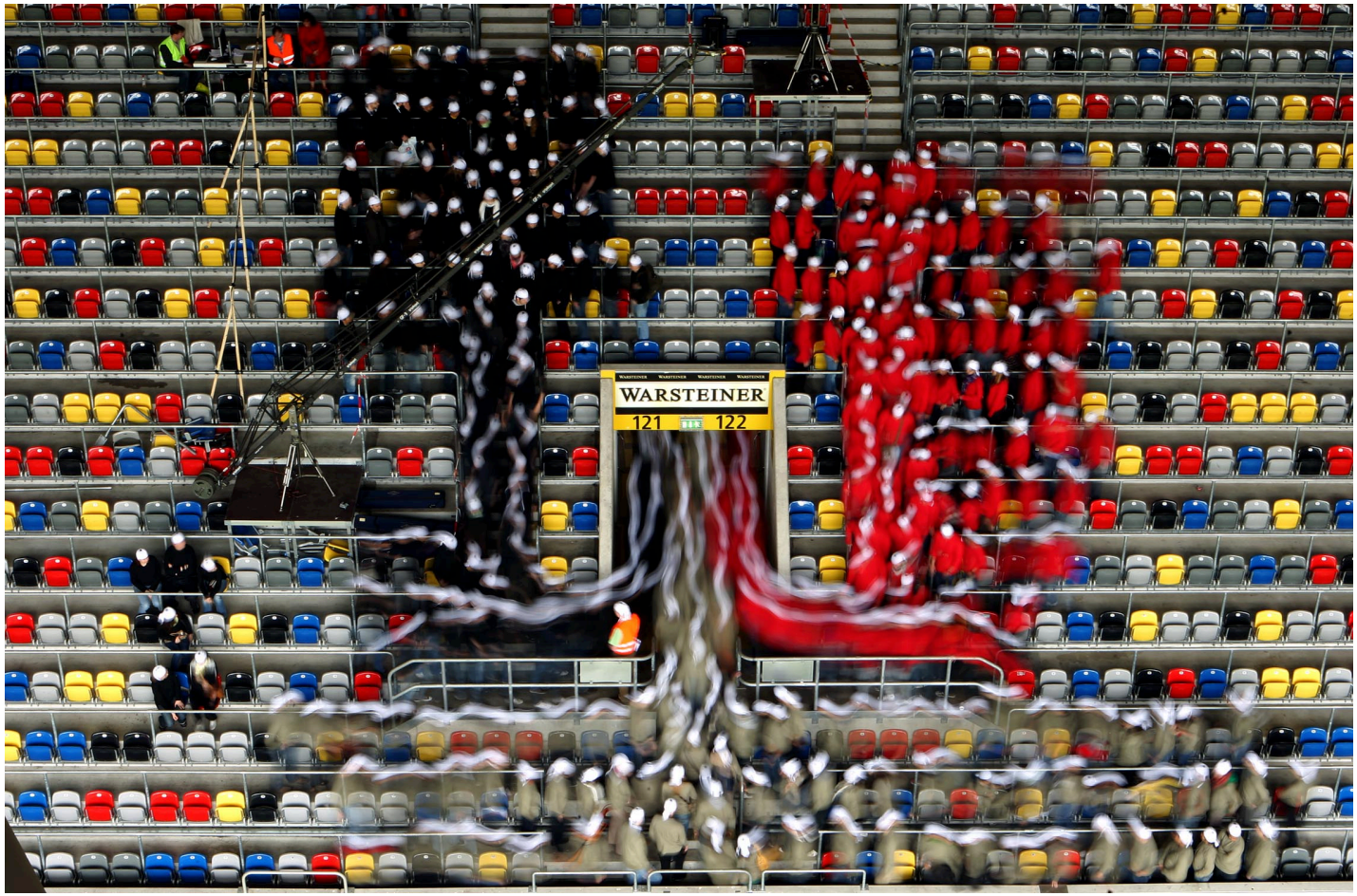
Pedestrian Dynamics - Experiments



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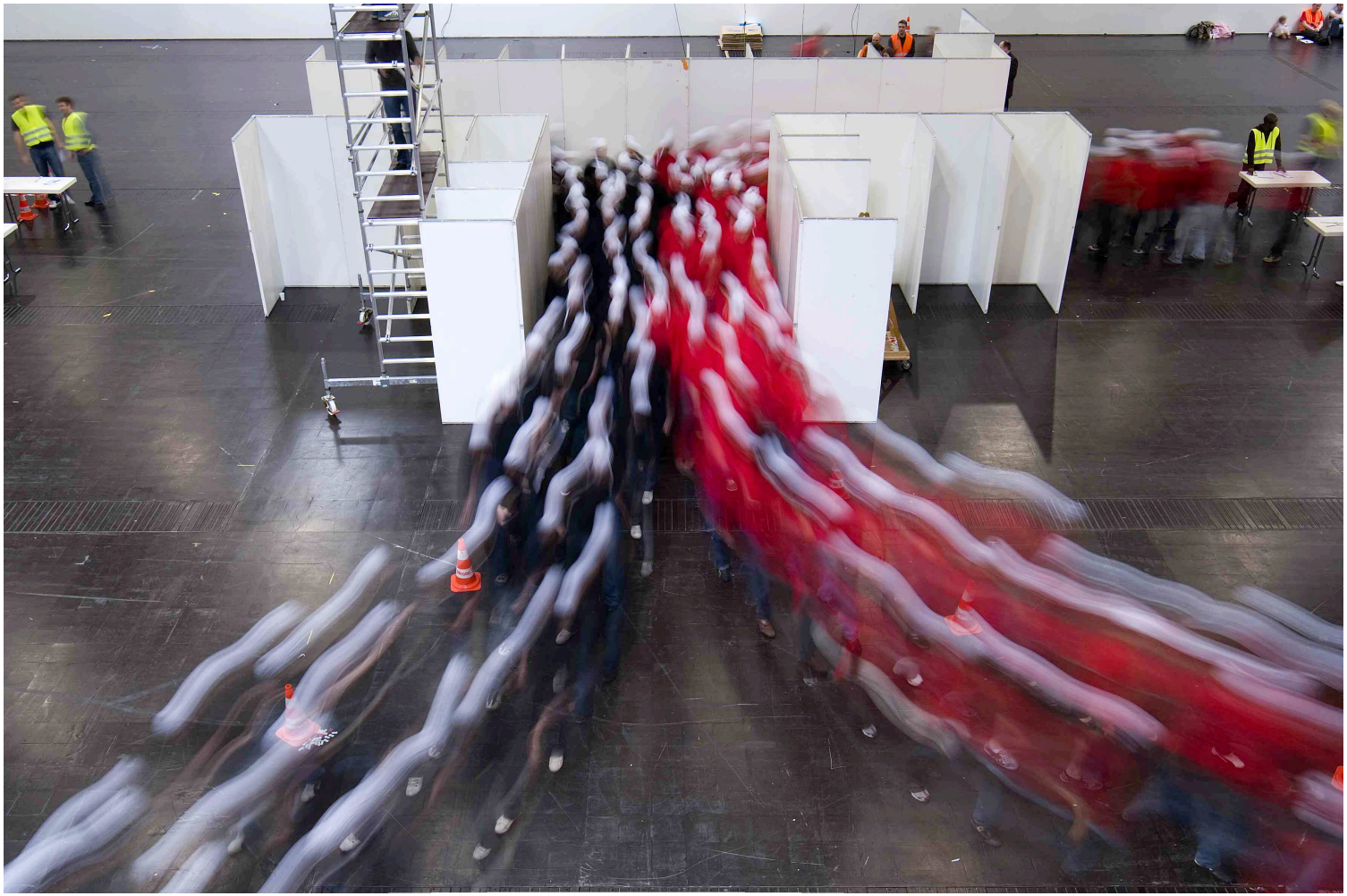
Pedestrian Dynamics - Experiments



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Pedestrian Dynamics - Experiments


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Mitglied der Helmholtz-Gemeinschaft

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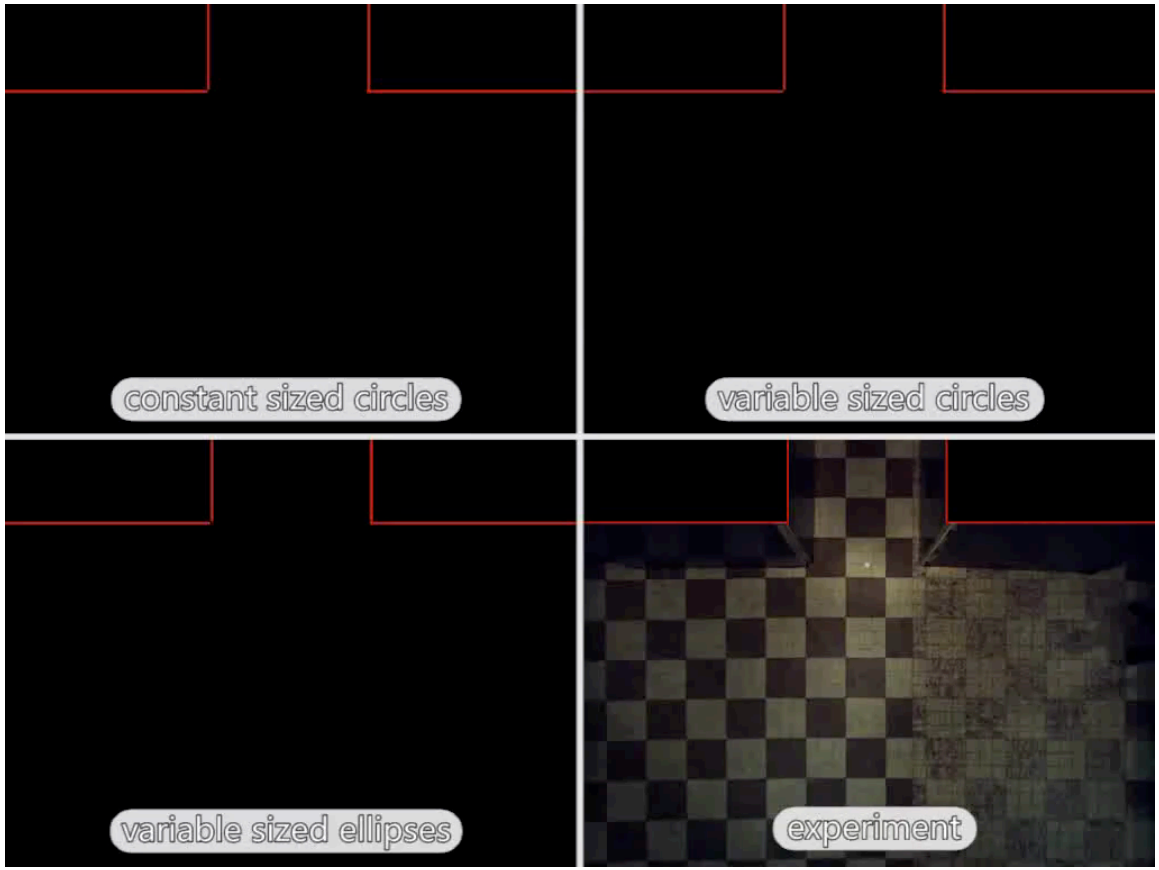
Pedestrian Simulation

- Development and maintenance of JuPedSim (Jülich Pedestrian Simulator)
- Idea: Provide a comprehensive open-source framework as a “playground” to academia
- JPScore, JPSvis, JPSreport, JPSeditor
- Written in C++
- www.jupedsim.org
- Jenkins Testing
- git repository

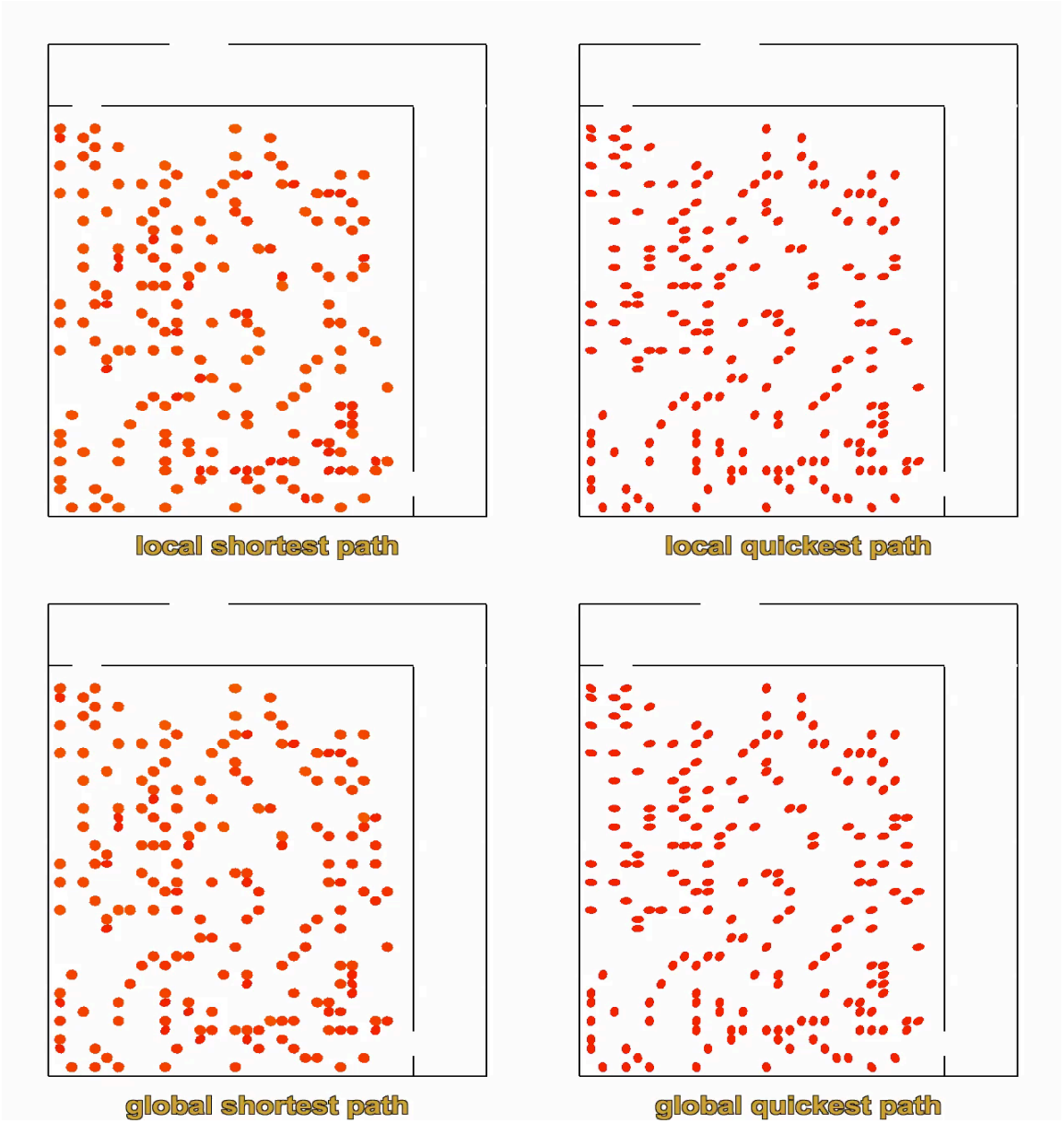
Pedestrian Simulation – Operational models

- Gompertz
- GCFM
- Tordeux



Pedestrian Simulation – Routing models

- Shortest Path
- Quickest Path
- Cognitive Map



Pedestrian Simulation – Wayfinding

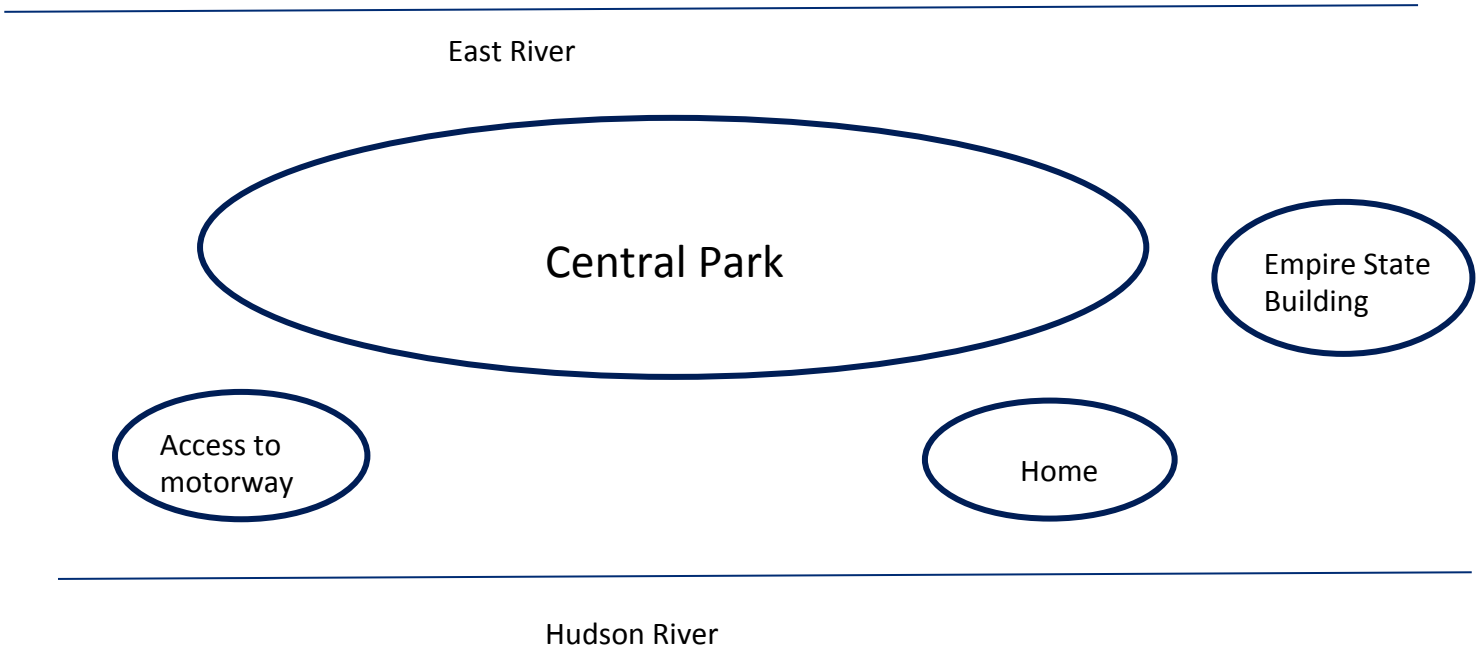
- Shortest path algorithms
- Travel time optimizations
- Minimum effort calculations

Assumption:

All agents have fulfilled, global knowledge about environment‘s spatial structure ☹

Pedestrian Simulation – Wayfinding

- Mental representation of spatial structure
  - Landmarks in the map represented by ellipses to model inaccuracy



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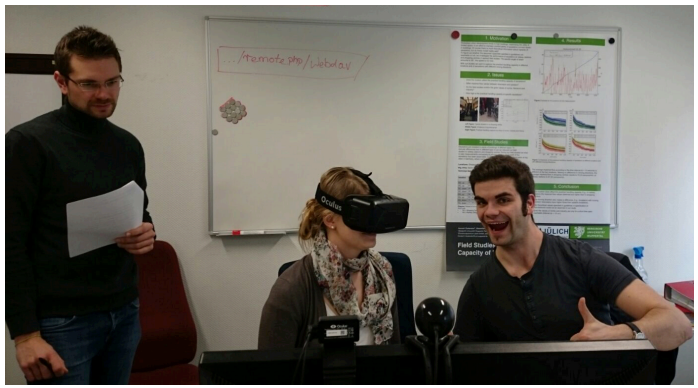
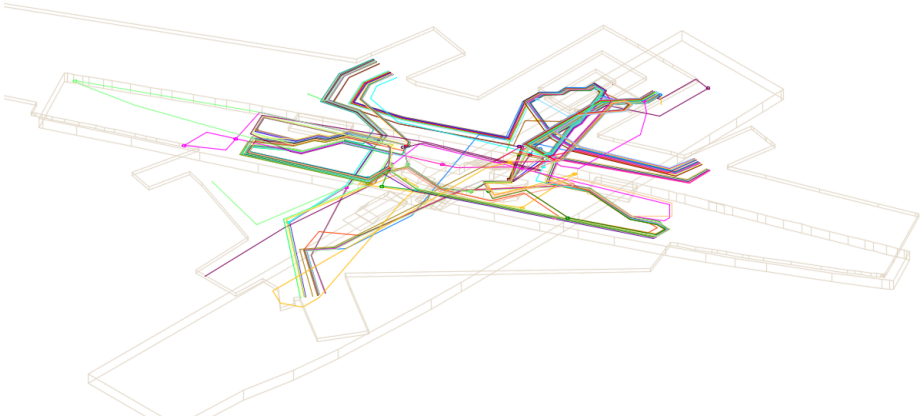
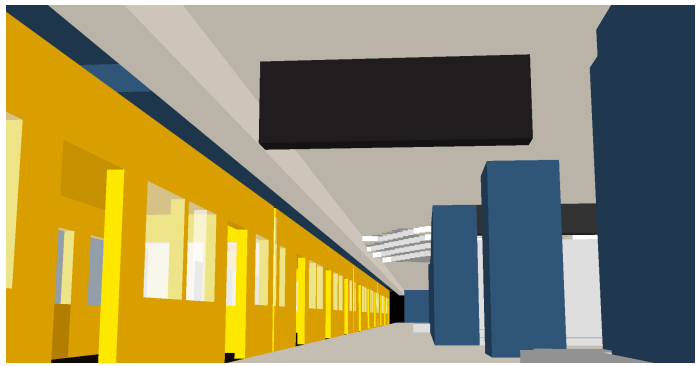
Pedestrian Simulation – Wayfinding

- at the very beginning
- Laboratory experiments data vs. VR
- current work:
  - Wayfinding in complex environments
  - Rendering of fire simulation data







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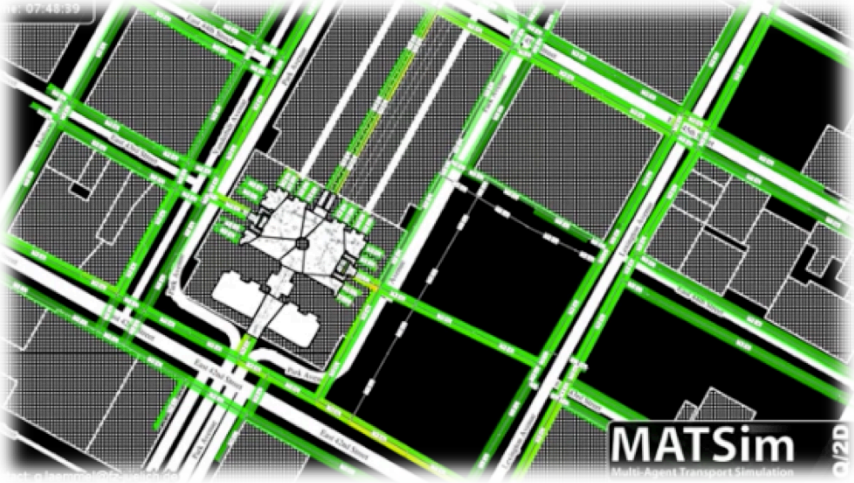
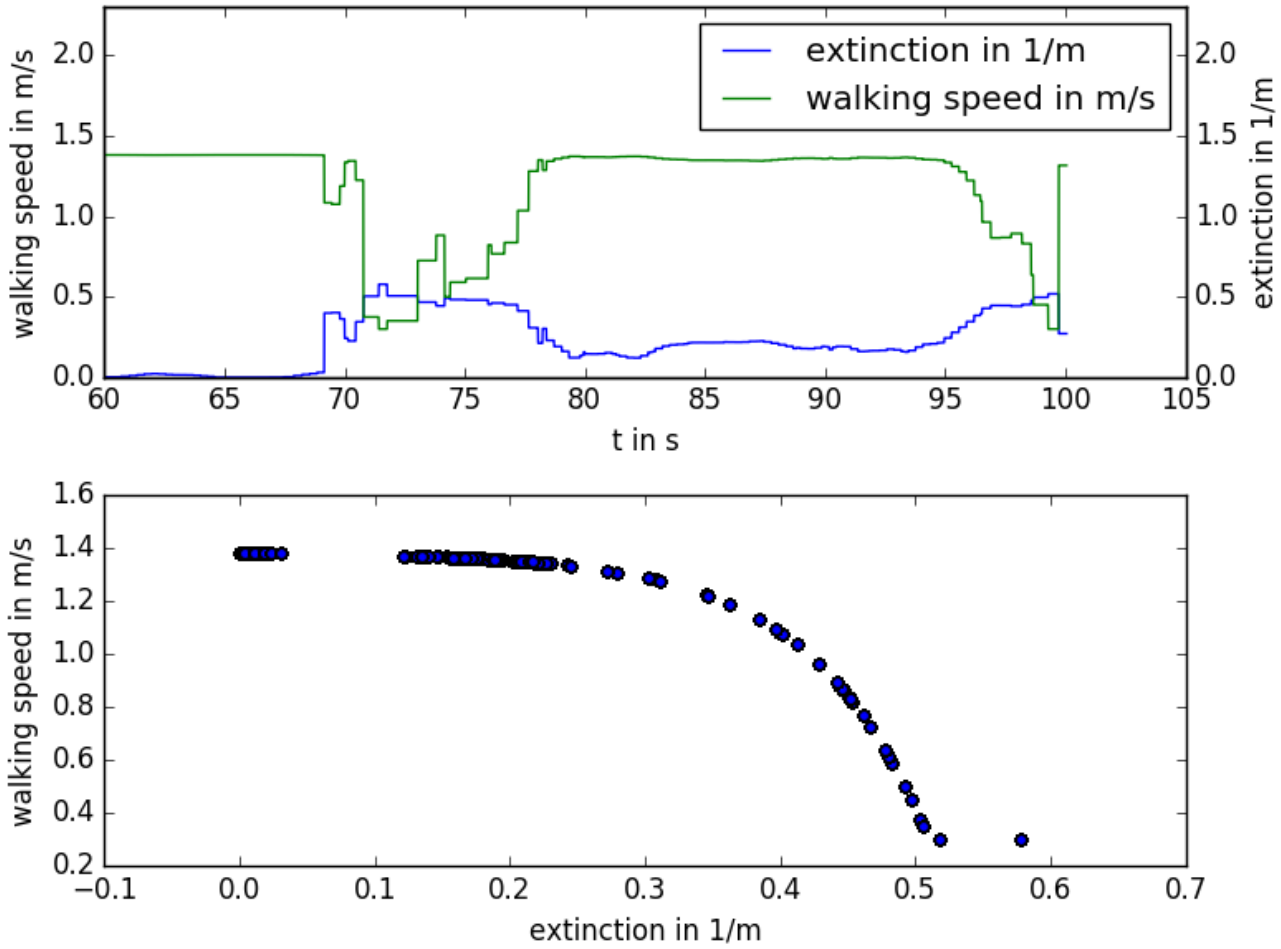
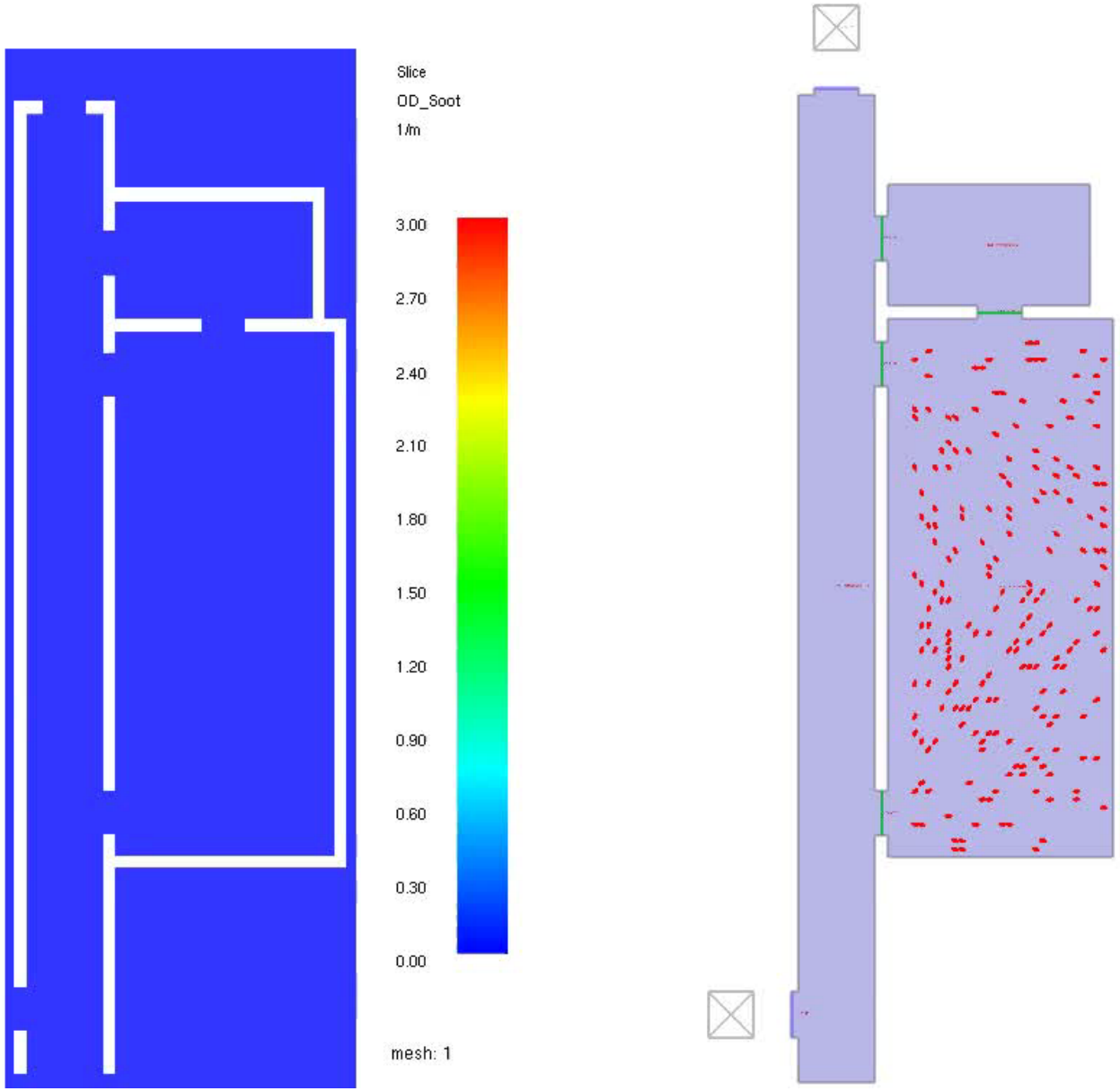
Pedestrian Simulation – Traffic



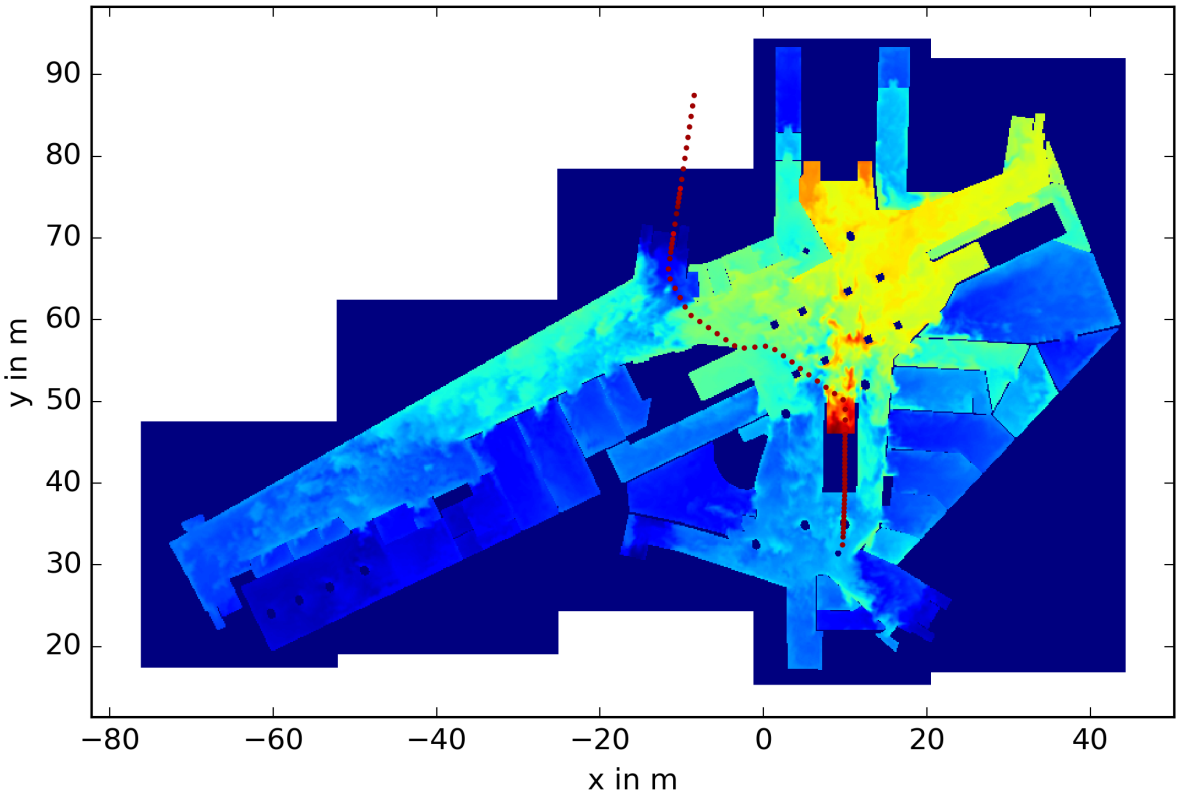
- intermodal traffic
- hybrid simulation (macroscopic + microscopic)

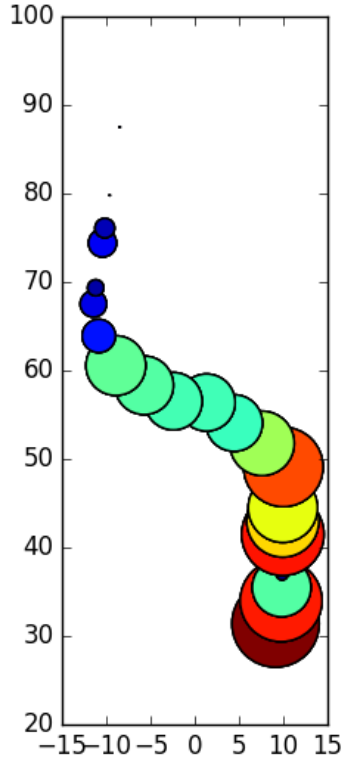
Pedestrian Simulation & Fire Simulation



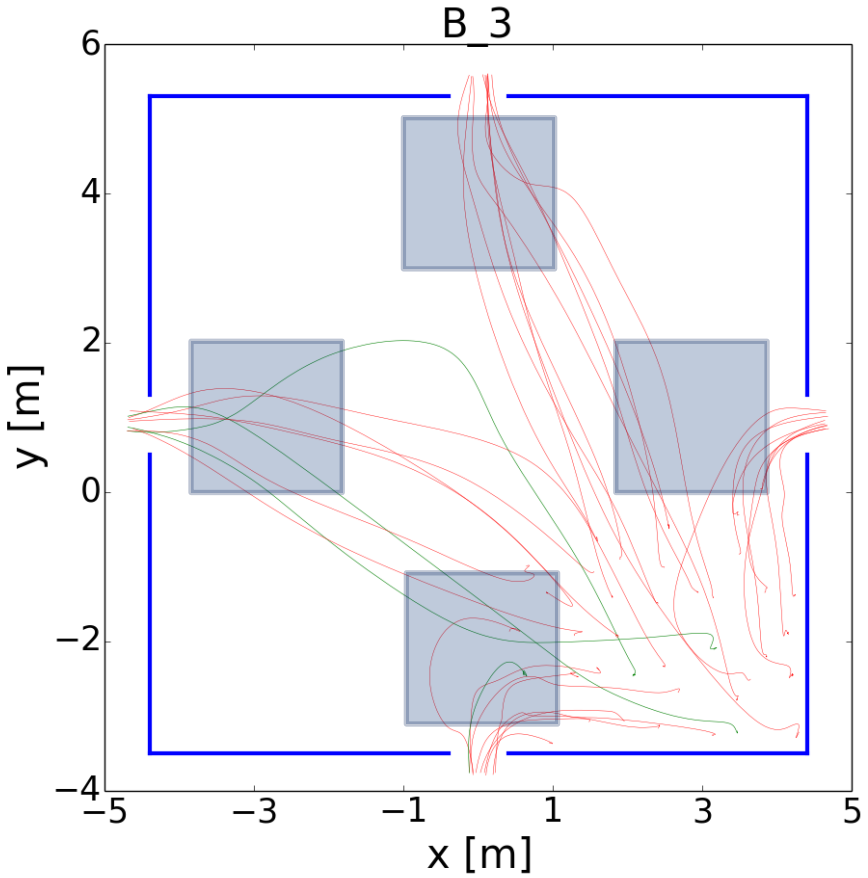


Pedestrian Simulation & Fire Simulation





Pedestrian Simulation & JPSreport

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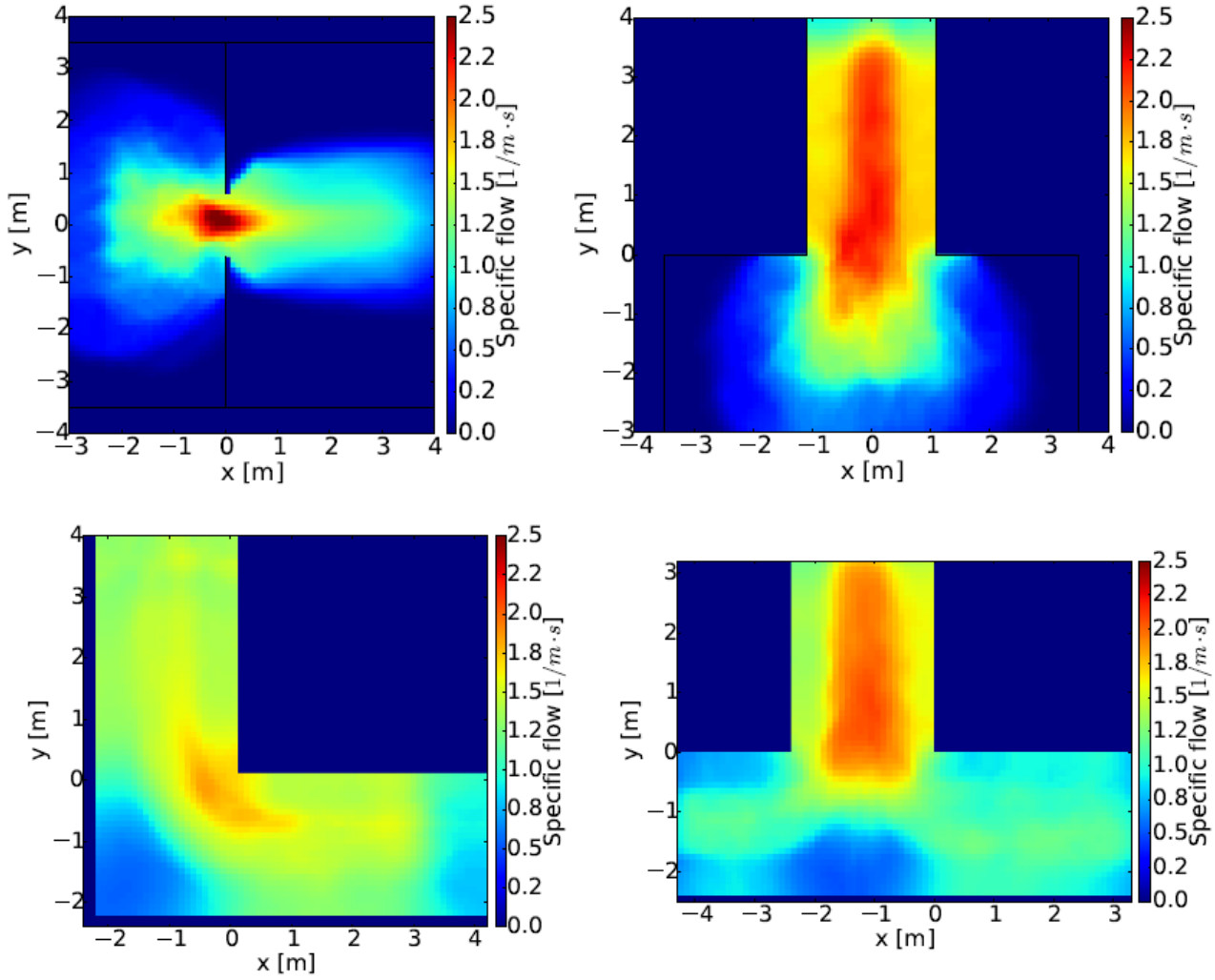
Pedestrian Simulation & JPSreport



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Fire Simulation

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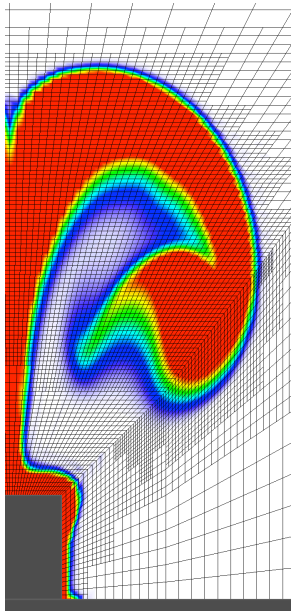
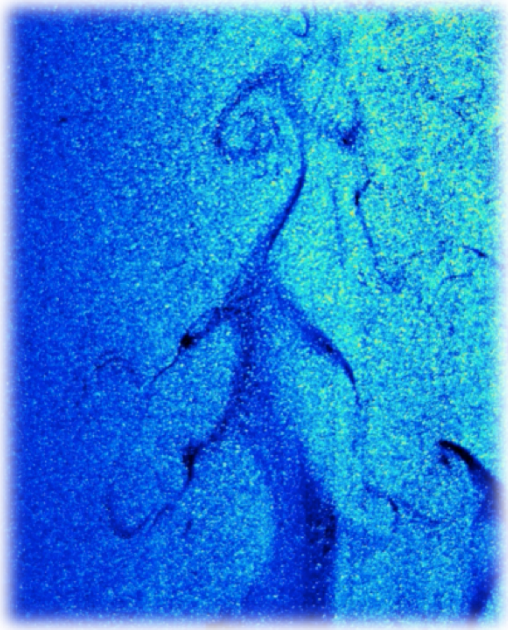
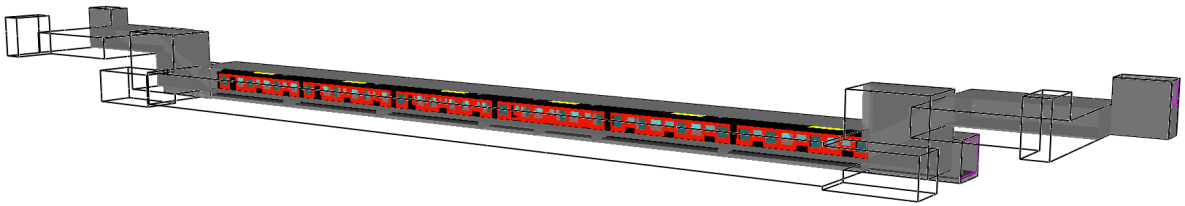
Fire Simulation

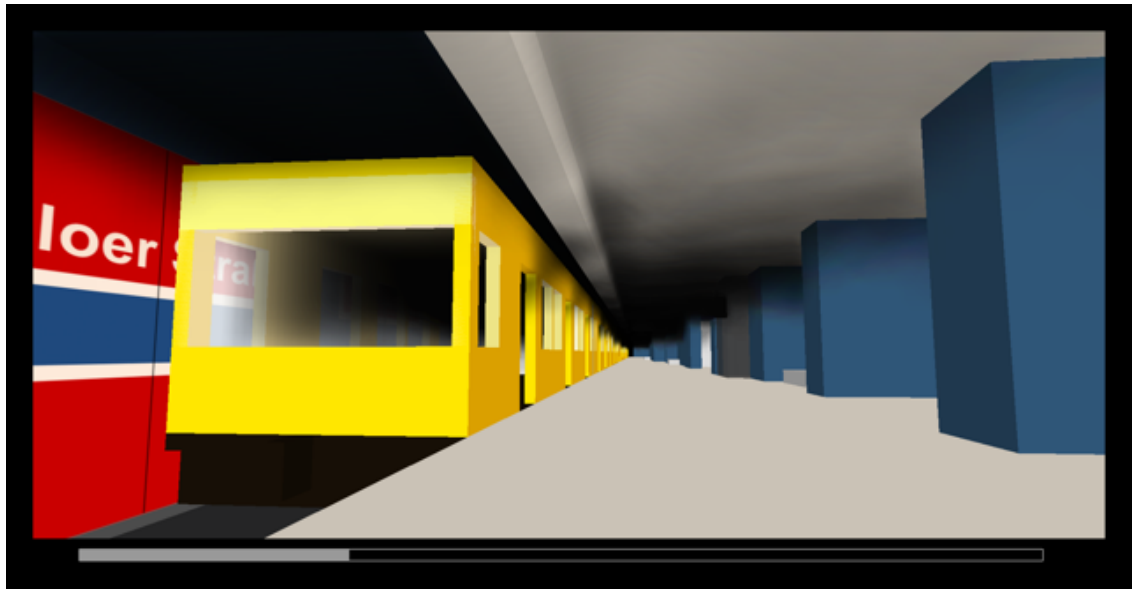




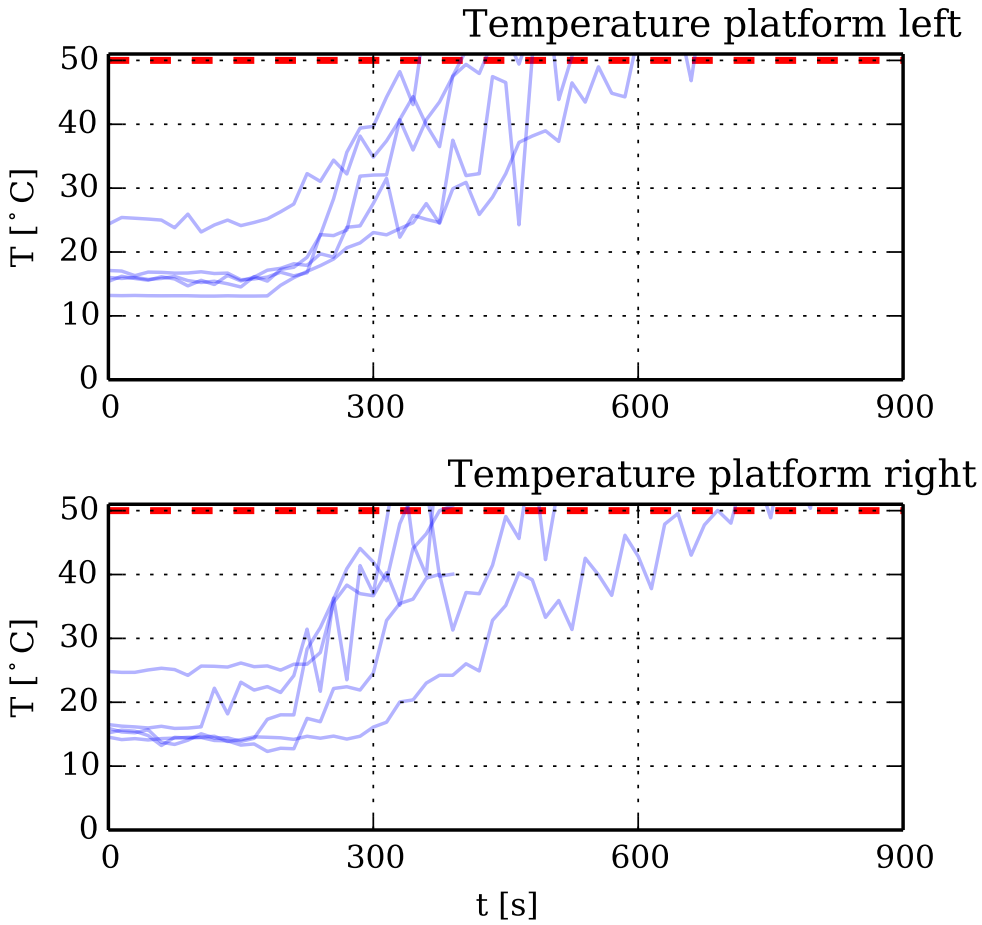


Fire Simulation

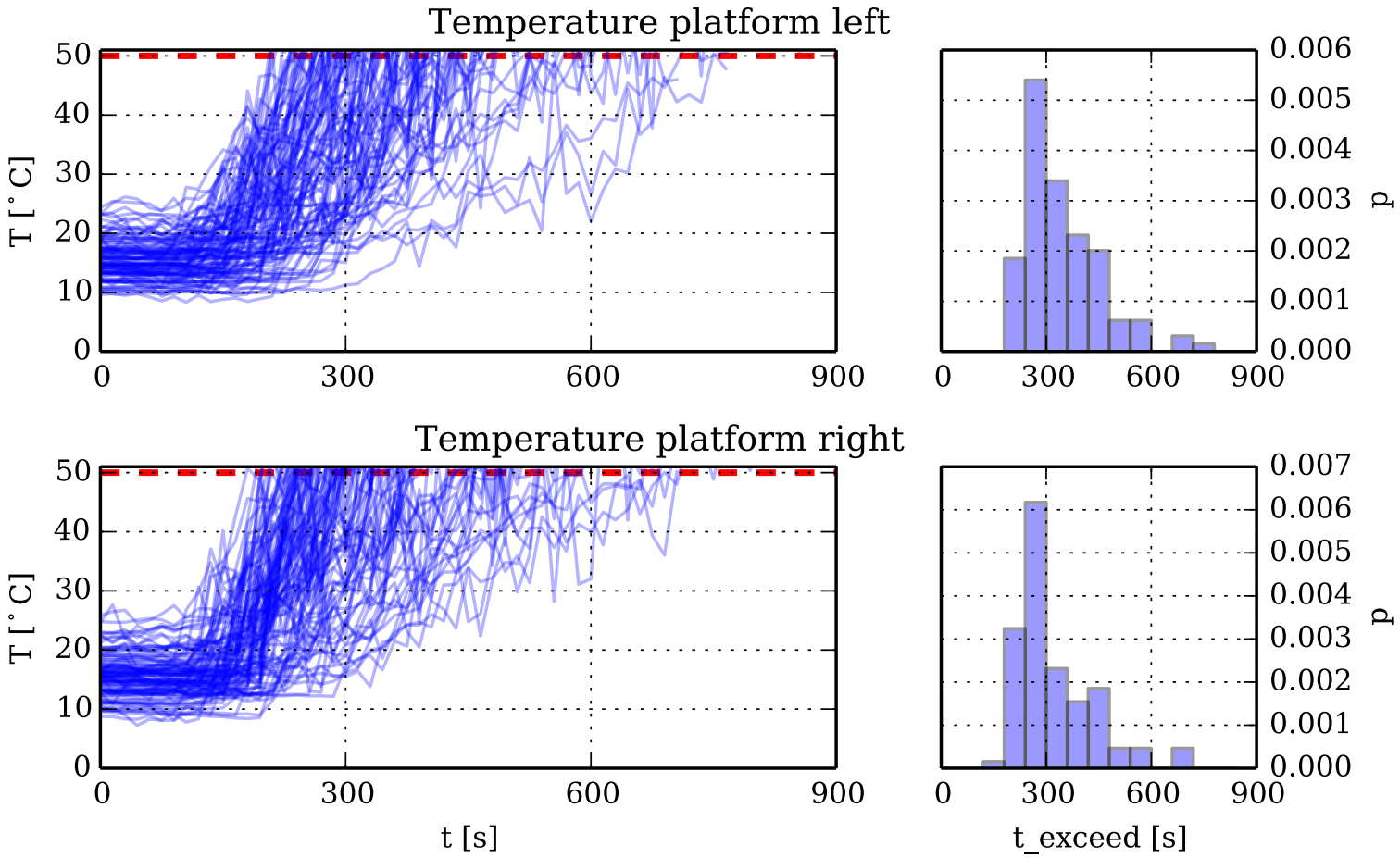
- NIST's Fire Dynamics Simulator (FDS)
- Multiple fire scenarios
  - location
  - design fire
- Climatic conditions
  - underground temperature
  - surface temperature
- LHS Sampling



Fire Simulation



Fire Simulation



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(My) research

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Translated acronym: optimisation of smoke management and escape routes in underground stations: experimentation and simulation.

Call: “Civil Security – Protection and Rescue in complex scenarios”

3 work packages:

1. Current State
2. Optimisation of smoke management
   (…)
   2.4 Escape routes: resilience and handicapped persons
   (…)
3. Rescue operations and crisis management

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ORPHEUS

Imtech

BVG

DB

FACH
Hochschule Aachen

RUB

BAM
Bundesanstalt für
Materialforschung
und -prüfung

NVIDIA

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IBIT

KARSTADT
Schöner shoppen in der Stadt

HEKATRON
Ihr Partner für Brandschutz

Team HF
Human Factors – Forschung Beratung Training

Mitglied der Helmholtz-Gemeinschaft

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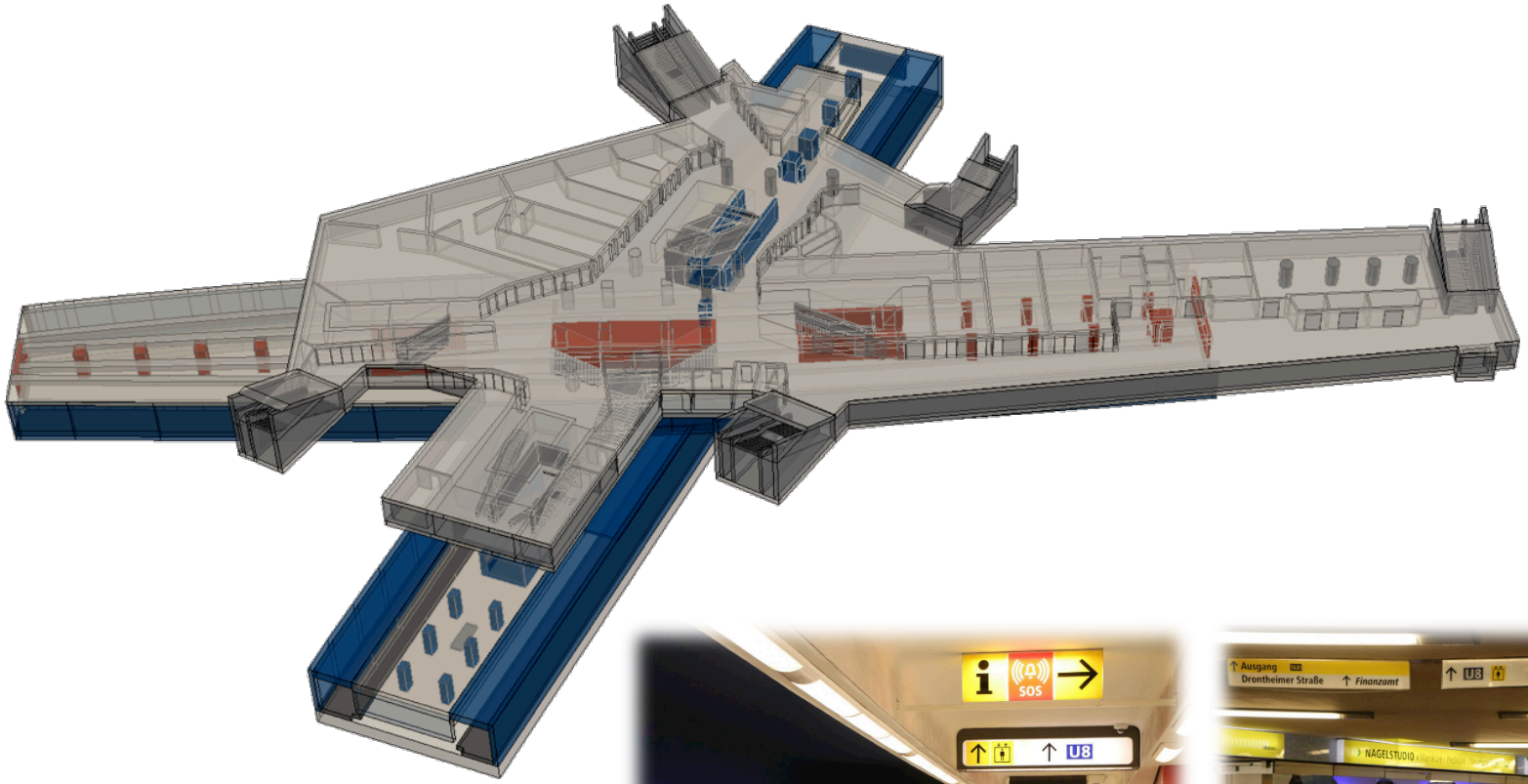


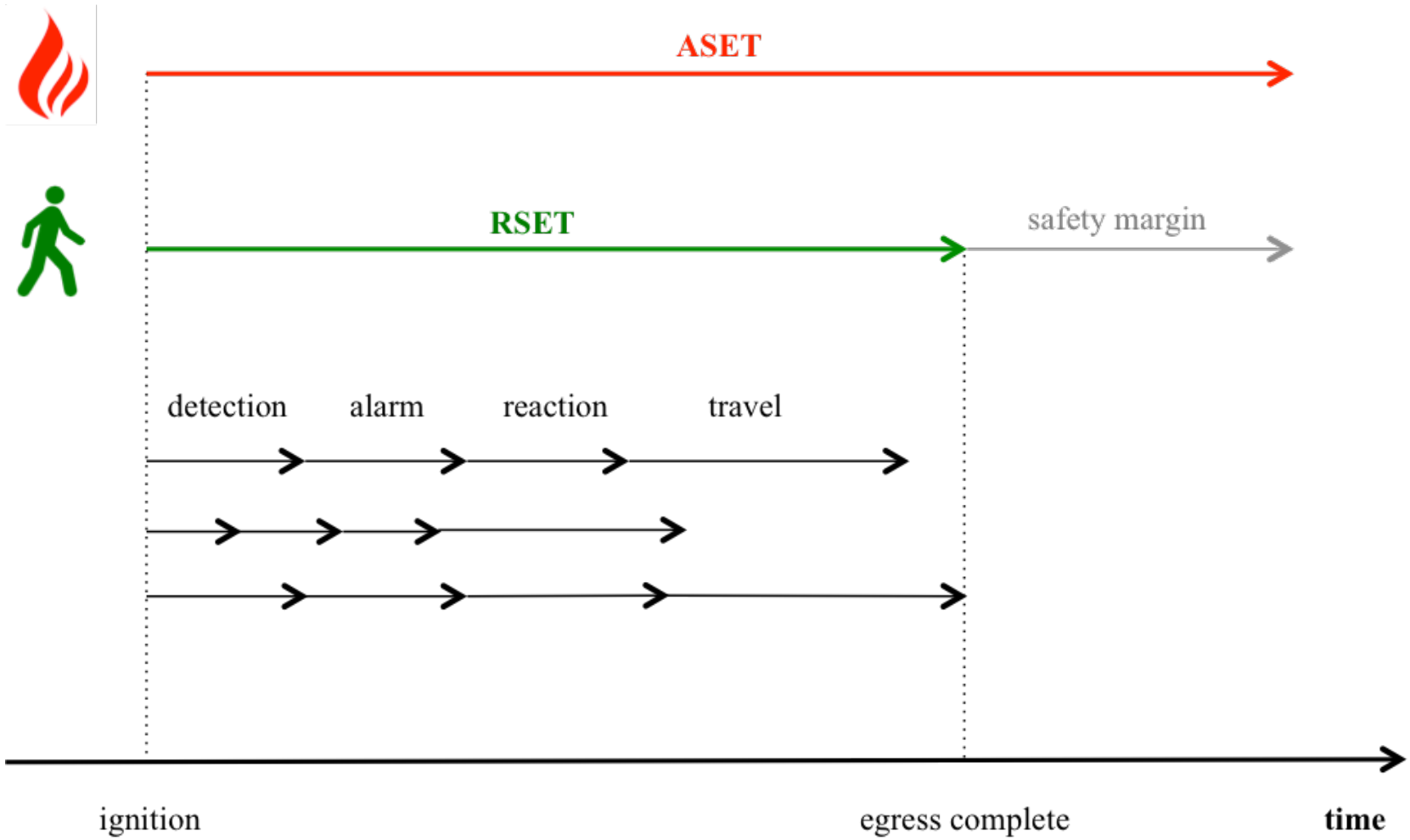
Research – Problem definition

- Life safety assessment with ASET / RSET concept

  ASET > *RSET* + *safety margin*

- ASET: Fire Simulation
- RSET: Evacuation Simulation
- Thresholds for ASET
  - optical density
  - temperature / radiation
  - toxicology
  - → **local + temporal resolution?**

Research – Problem definition



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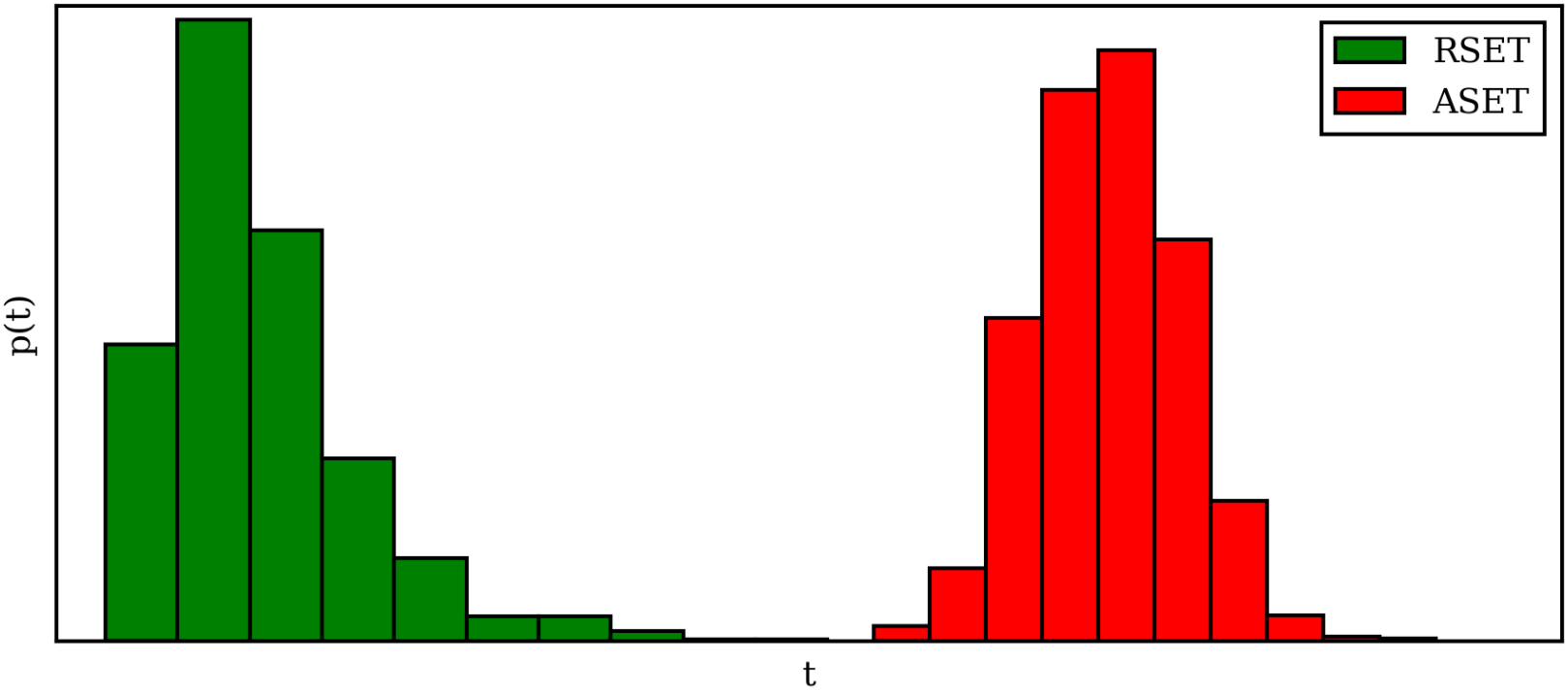
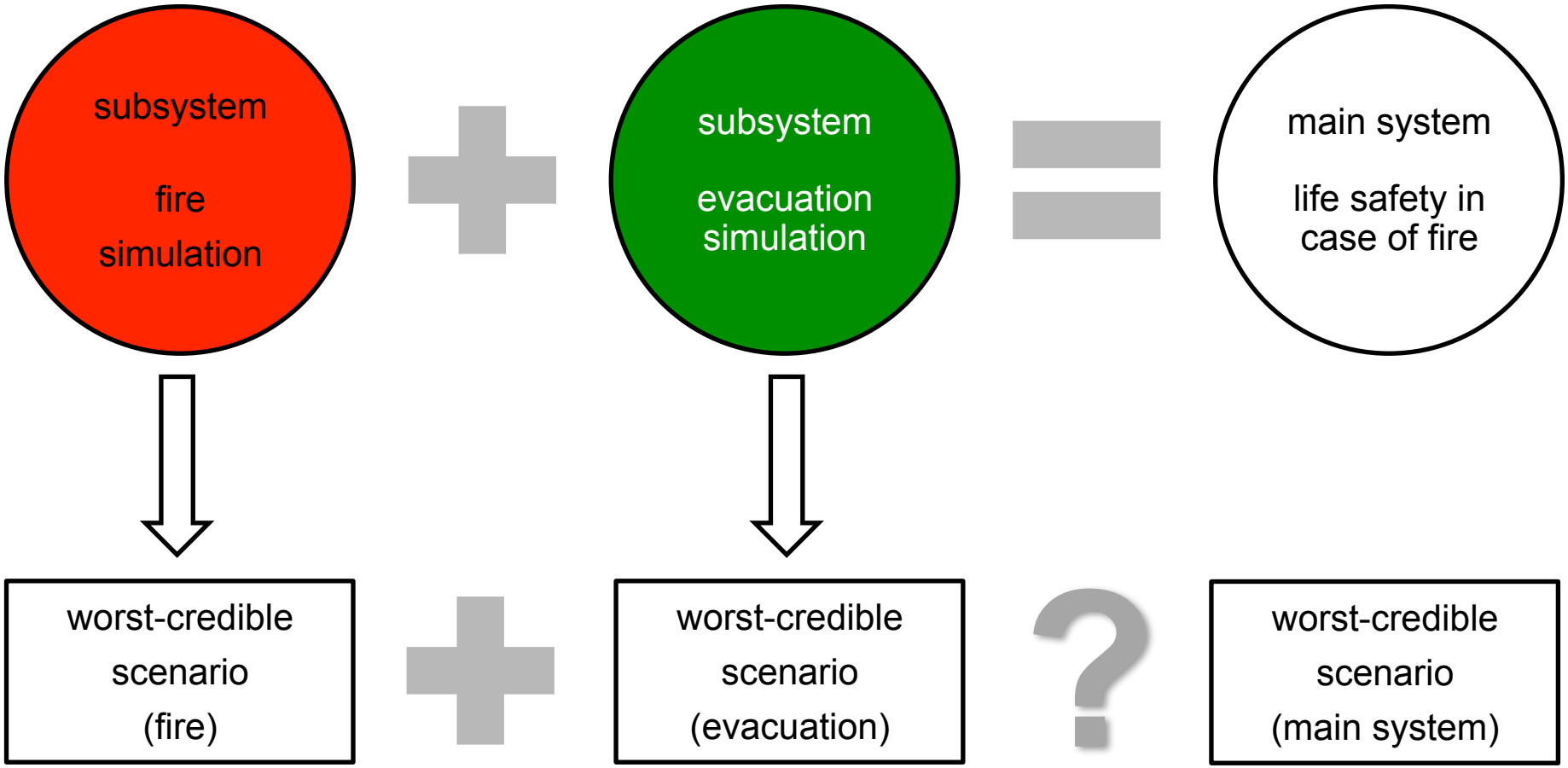
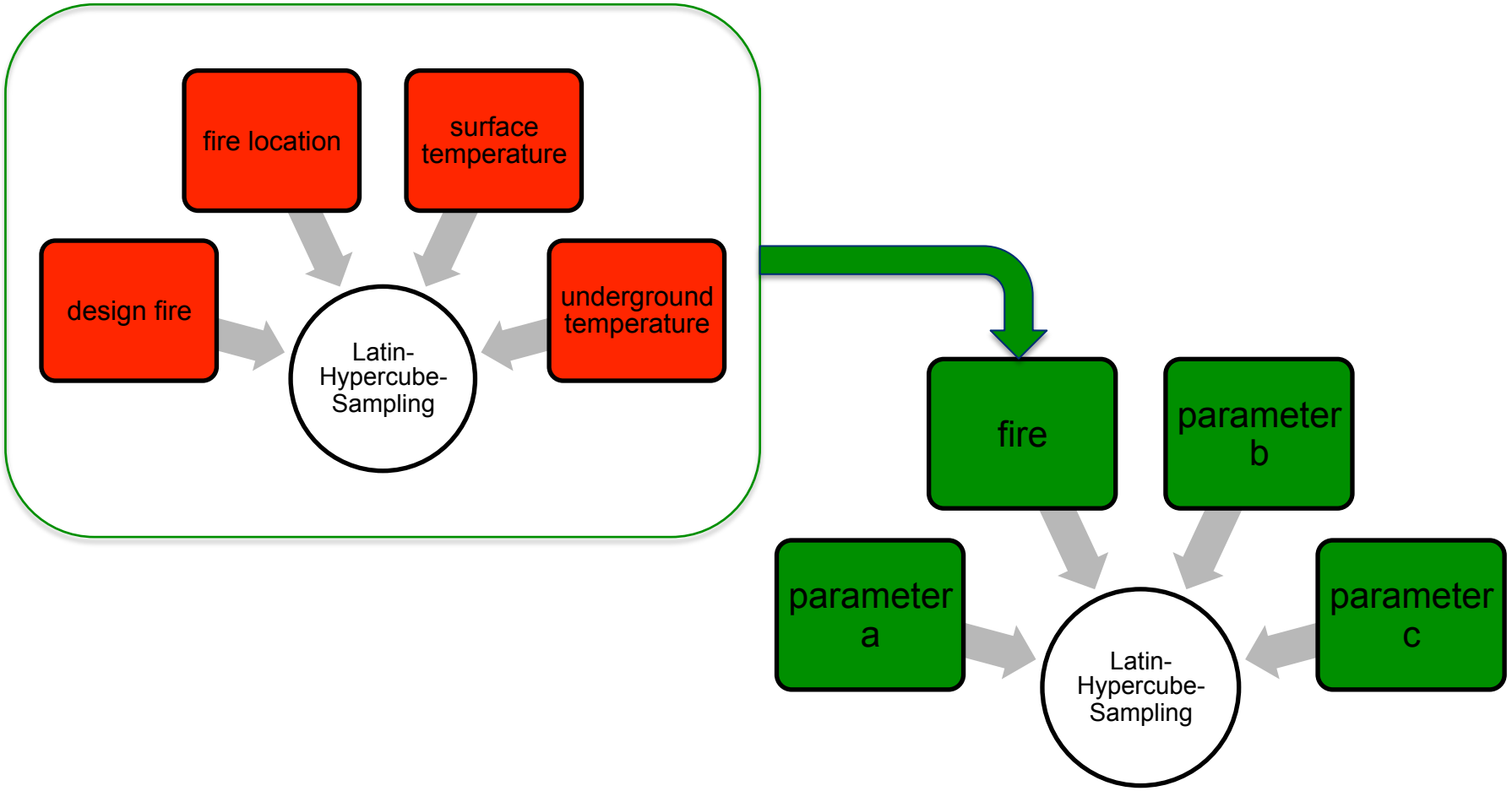
Research – Problem definition



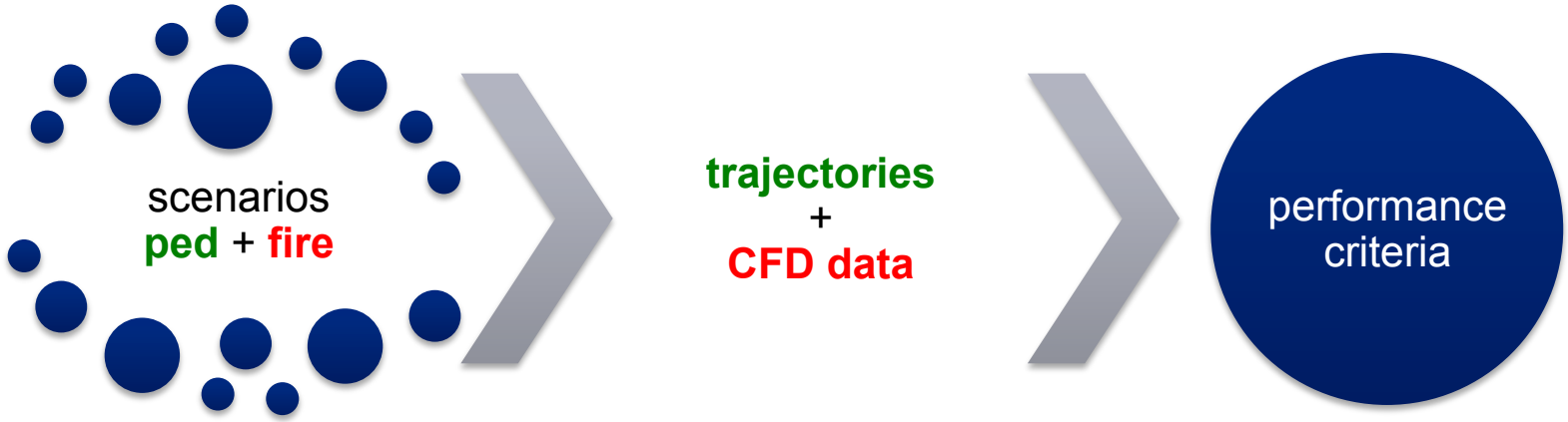
Research – Problem definition



Research – Basic Idea



Research – Putting it together



Design of Experiment

Data Processing

Risk Analyses

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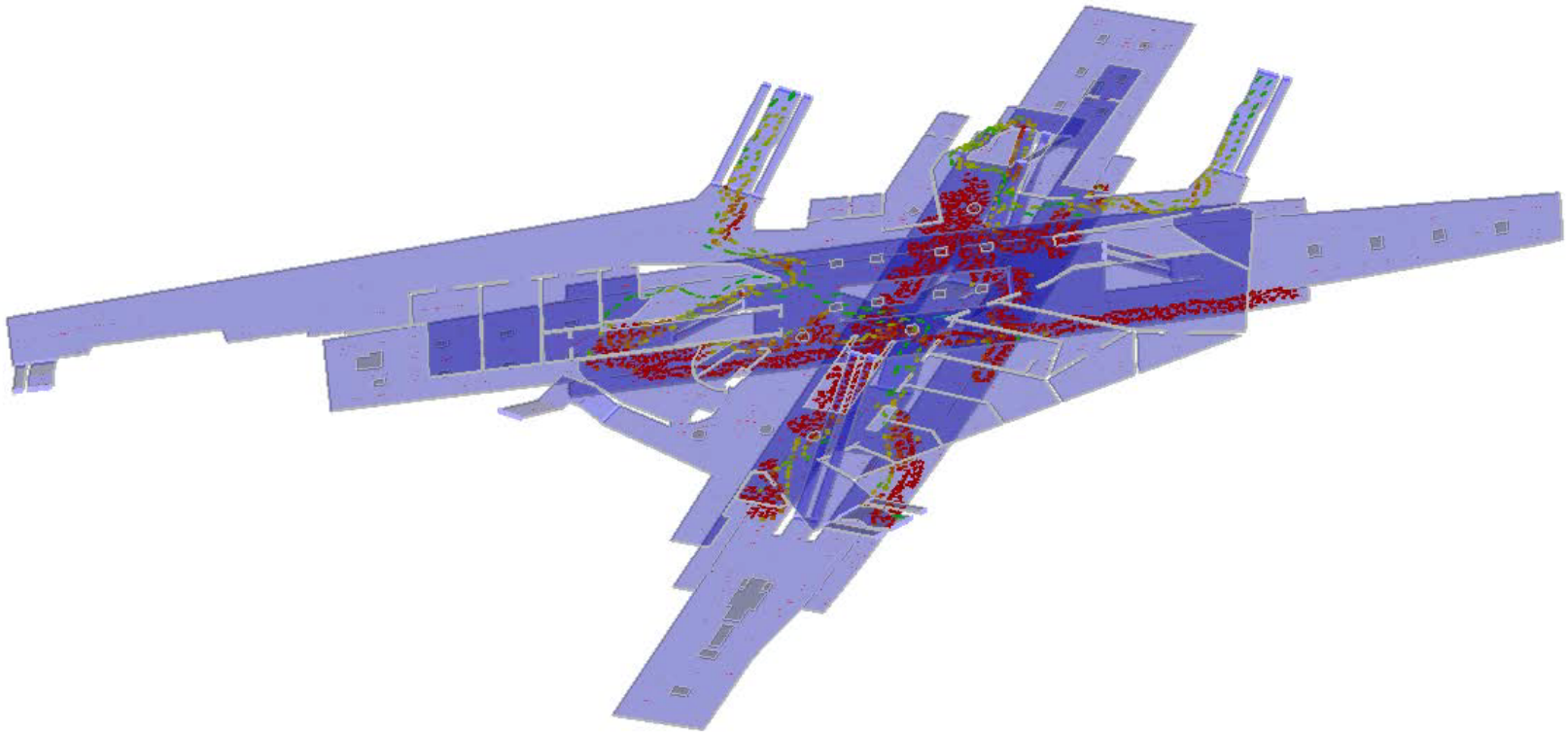
Pedestrian Simulation



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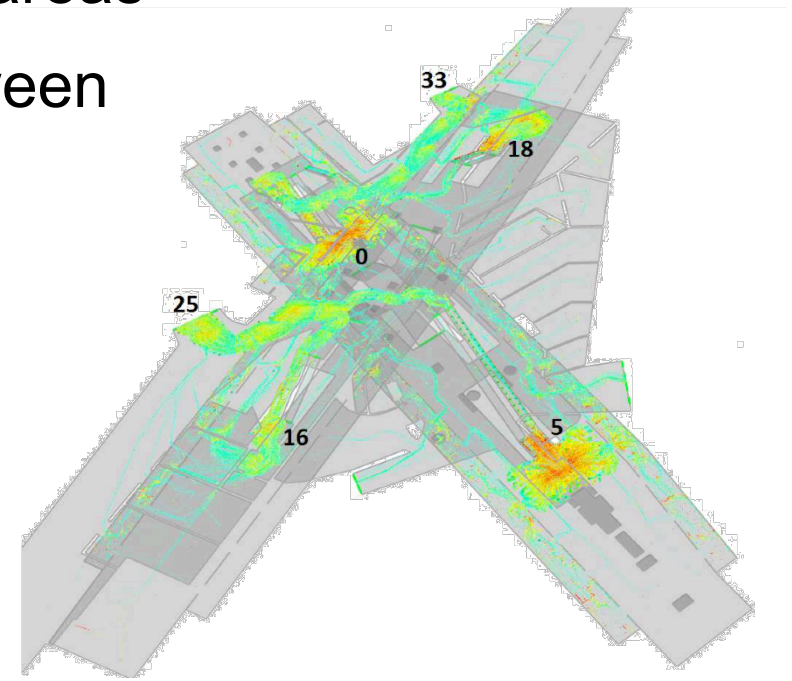
Motivation & Goals

- exchange about pedestrian dynamics
  - modelling
  - experimentation
  - analysis
- your department's expertise in data mining and databases
  - retrieval, analysis, and visualization of data for analysis and pattern discovery
- linguistic advances

Motivation & Goals

- Design of Experiment
- resolve ASET/RSET locally and temporally
- localise and quantify jam areas
- determine difference between trajectories
- … others?



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Thank you!